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Empowering Supply Chain Literacy Through Sustainable Innovation Education: A Community-Based Approach

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Abstract: *This paper describes a community service intervention to enhance supply chain literacy skills for a workshop called "Global Networking: Sustainable Innovation in Supply Chain." The workshop was held in October 2024 to target university undergraduate students and early career logistics/operations managers in the field of omnichannel logistics, procurement innovation, and sustainability. The need for the proposed solution in the community lies in the scarcity of supply chain innovation and the necessity to adopt green and digital transformation. The structure of this community service activity includes three significant areas: the interaction process, case analysis, and participant evaluation of the workshop. The outcomes show that the participants of the workshop improved their knowledge of sustainability and procurement partnerships, as well as enhanced engagement in the program. There exists a high potential for the proposed model to work in the educational institutions in the concerned communities. The proposed workshop satisfies two distinct aspects to fulfill knowledge acquisition and build the human capital of the logistics industry.*

Introduction

The growing intricacy of worldwide supply chains because of technological progress and environmental issues, and shifting consumer needs, has changed the required abilities for supply chain professionals. The system generates new risks that affect delivery schedules and

the quality of materials and components, as well as the availability of logistics infrastructure (Andry et al., 2022a). These developments are of particular importance in the Indonesian context because there is an ever-growing need for a properly organized and efficient work environment (Saptaji et al., 2024). Under these circumstances, retail is transforming into data-driven retailing that is channel-agnostic, where the lines that separated retailing in-store and online are becoming less distinct, thereby becoming known as omnichannel retail (Mishra et al., 2024). Omnichannel retailing serves as a basic requirement for supply chain operations because it focuses on digital systems and distribution and logistics, and transportation management (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024). This is due to the importance of supply chain integration in the implementation of an omnichannel retailing approach (Song et al., 2021). Omnichannel stands as the method that seeks to create an uninterrupted customer experience across all channels and devices, including online platforms and mobile devices, and physical retail locations (Watanabe et al., 2021). The supply chain field operated under traditional methods, which focused on logistics efficiency and cost reduction, but now requires skills for sustainability and digital integration, and collaborative procurement methods (Chopra, 2019; Ivanov et al., 2023). The new business environment requires channel integration to function as a basic competitive requirement rather than a unique selling point (de Sousa et al., 2021). By using digital technology in retail operations, a paper revealed how omnichannel retail implementation affects sustainable retail outcomes and investigates their combined impact (Vhatkar, Raut, Gokhale, Kumar, et al., 2024). The Indonesian environment makes this change a particularly suitable match. As Southeast Asia's manufacturing and logistics center, Indonesia must handle two opposing forces that challenge its ability to build sustainable supply chains that incorporate digital systems. Applied knowledge and strategic thinking abilities continue to pose challenges for university students and early-career professionals in the current educational environment. The existing literature contains a significant gap because most academic studies about omnichannel retailing concentrate on European and North American markets while neglecting to incorporate data from South American and African emerging economies (de Sousa et al., 2021). The academic studies about omnichannel retailing focus their research on European and North American

markets, but they have yet to include data from South American and African emerging markets (de Sousa et al., 2021). Examining omni-channel retailing from the perspective of a developing nation, such as Indonesia, is important and emphasizes the need for practical education (de Sousa et al., 2021).

The issue of omnichannel shopping has also come to the fore as a great concern for companies, as it has changed the value perception of customers when interacting with multiple channels (Bharathy, 2021). The need for unobstructed shopping has forced many businesses to undertake significant digital transformations with the help of AI, ML, and big data, to create seamless personalized customer experiences (Watanabe et al., 2021). Though higher education institutions are increasingly incorporating supply chain management courses within their curricula, the education the students gain remains largely theoretical and lacking hands-on experiences within the respective industry settings (Watanabe et al., 2021). The evidence clearly points to the fact that the performance measurement of service operation based on the criteria of waiting and service time is linked to customer satisfaction within the service settings of a café (Nurprihatin et al., 2024). The study emphasizes efficiency and customer experience (Nurprihatin et al., 2024). The study of manufacturing receives major attention from researchers, yet these findings do not apply to retail operations because the two industries operate on separate operational systems (Song et al., 2021). The retail supply chain network becomes especially complex because omnichannel retailers focus on individual consumers while working with various upstream distributors and suppliers (Song et al., 2021). This becomes a challenge because omnichannel retail serves to increase complexity by having to manage all elements of the supply chain because of the proliferation of channels (Mishra et al., 2024). These practices include a range of digital technologies, which have been categorized into three technologies (Vhatkar, Raut, Gokhale, Kumar, et al., 2024):

1. Data-driven technologies can refer to big data analysis, social media analysis, cloud computing, cyberspace, sensor technologies, monitoring, and control systems for humans, products, machines, and equipment.
2. Process technologies include digital payment systems, warehouse management systems, Augmented Reality systems, and Virtual Reality systems.

3. With Generative AI, technologies can refer to chatbots, virtual assistants, visual search, voice search, and personalized retail.

This gap is further highlighted by the fact that a few studies address environmental issues with theory and coordinated strategy, emphasizing the need for more practical education in this area (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024). A workforce that is ill-prepared to adopt sustainable innovation in supply chain practices could undermine national competitiveness. Logistical functions, in and of themselves, are a form of process reengineering that creates customer value, and an area of critical success for multichannel businesses is the need for a highly educated workforce (Mishra et al., 2024). Organizations focus on building analytical skills to better understand their customers through data analysis, which enables them to create dynamic pricing models and superior service delivery, and optimized supply chain management (Mishra et al., 2024). The research demonstrates that e-commerce sustainability and profitability become achievable when businesses use suitable retail strategies through innovative partnerships (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024). Digital technology functions as a key factor that enhances all financial and environmental, and social elements of omnichannel operations. The need for digital literacy stands as an essential requirement for organizations to address this issue (Vhatkar, Raut, Gokhale, Kumar, et al., 2024). Amazon has developed a new supra-omnichannel system for apparel that achieves success through the combination of digital fashion technology with instant manufacturing to deliver personalized shopping experiences (Watanabe et al., 2021). The organization of sustainable supply chains with digital systems will become a main driver for economic growth throughout the next ten years. The transition process shows complexity because researchers need to establish methods for comparing the sustainability of traditional retail against online shopping practices, since packaging waste together with delivery vehicle emissions produces more environmental harm than car trips to physical stores (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024). The process of product returns leads to major environmental consequences because it requires transportation energy and manufacturing and packaging operations (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024).(Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024). A workforce that is ill-prepared to adopt sustainable innovation in

supply chain practices could undermine national competitiveness. Logistical functions in and of themselves are reengineering a process to create customer value, and an area of critical success for multichannel businesses, is the need for a highly educated workforce (Mishra et al., 2024). Organizations focus on building analytical skills to better understand their customers through data analysis which enables them to create dynamic pricing models and superior service delivery and optimized supply chain management (Mishra et al., 2024). The research demonstrates that e-commerce sustainability and profitability become achievable when businesses use suitable retail strategies through innovative partnerships (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024). Digital technology functions as a key factor which enhances all financial and environmental and social elements of omnichannel operations. The need for digital literacy stands as an essential requirement for organizations to address this issue (Vhatkar, Raut, Gokhale, Kumar, et al., 2024). Amazon has developed a new supra-omnichannel system for apparel that achieves success through the combination of digital fashion technology with instant manufacturing to deliver personalized shopping experiences (Watanabe et al., 2021). The organization of sustainable supply chains with digital systems will become a main driver for economic growth throughout the next ten years. The transition process shows complexity because researchers need to establish methods for comparing the sustainability of traditional retail against online shopping practices since packaging waste together with delivery vehicle emissions produces more environmental harm than car trips to physical stores (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024). The process of product returns leads to major environmental consequences because it requires transportation energy and manufacturing and packaging operations (Vhatkar, Raut, Gokhale, Cheikhrouhou, et al., 2024).

The community service activity described in this paper was developed to meet a specific and urgent requirement that emerged from these obstacles. A pre-activity situational analysis, consisting of surveys, informal student interviews, and faculty consultations, revealed that more than 72% of respondents lacked awareness of emerging supply chain paradigms, as illustrated in Figure 1. The participants expressed a strong desire to gain actual knowledge about sustainable logistics practices and procurement partnerships, and supply chain

innovation through technology. This is brought about by the persistent challenges posed by the ever-increasing complexity in supply chain management, which begets visibility challenges, production challenges, and inefficient integration across various business units (Andry et al., 2022b). The research results demonstrate an immediate need to create educational activities that merge theoretical supply chain knowledge with ethical and professional practice.

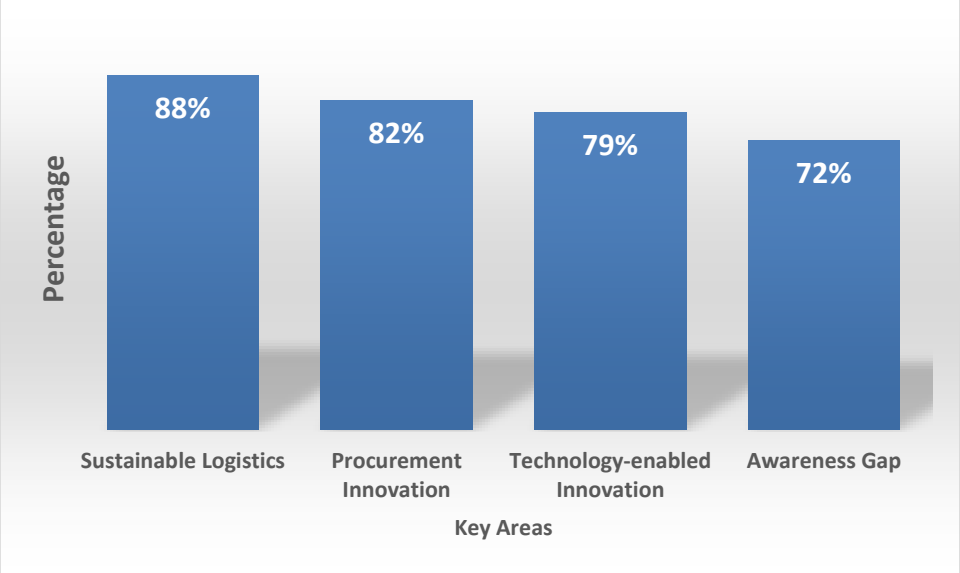

Figure 1. Situational Analysis Before Workshop

The project followed community service principles through its establishment as an educational platform that enables shared learning experiences between students and faculty. The program design focused on developing critical thinking abilities through reflective discussions, which led to team-based problem-solving approaches for actual logistics problems. The content selection process involved choosing sustainable innovation together with omnichannel operations and procurement collaboration because academic importance and industry requirements made these topics suitable for creating a useful and repeatable activity.

The subject of this community service was selected in response to a clear mismatch between current supply chain education and the competencies demanded by industry. The development of sustainable innovation, together with omnichannel operations and procurement

collaboration, stands as the focus because these skills remain underdeveloped in students and entry-level professionals. The academic study of these subjects appears in current supply chain research, and organizations must implement them to handle complex systems and digital transformation, and environmental challenges. The knowledge delivery system ensures transferability and scalability through its interconnected design, which supports multiple industry applications to generate extended program results.

The program aims to create social transformation through its work in developing human capital within the logistics and supply chain industry. The participants are expected to be able to think individually and critically, improve their systems understanding, be able to implement practices sustainably, and improve their team-building skills. The learning environment promoted by this program encourages a paradigm shift from the conventional way of learning, which involves mere observation, to active, reflective, and participatory learning. This activity is intended to produce a workforce qualified to deliver sustainable and ethical supply chains linking academic and vocational skills.

Another study has noted the need for integration of marketing, finance, and production functions within the manufacturing supply chain (Andry et al., 2023). A paper suggested the formation of a Decision Support System using Extreme Programming to exemplify the role of information systems in enhancing the supply chain participants' responsiveness (Andry et al., 2023). This aligns with the goals of the current research project, which aims to introduce early learners to the complexities of supply chain concepts and enhance decision-making using information technology. Considering the fundamental principles of supply chain integration, performance, and information presented in the research cited above, the community workshop of the proposed research project seeks to address the importance of using education through systems.

It is in the same spirit as the present research project, which is to familiarize young learners with the intricacies of the supply chain and facilitate the decision-making process with the aid of information systems. In view of the foregoing research and considering the principles of Integration of Supply Chain, Performance of Supply Chain, and Information in Supply

Chain, the proposed research project community workshop seeks to underline the role of education, in this case, education through systems. This paper proposes a workshop on education in sustainable innovation to give participants significant experiential learning. This is mostly since the program incorporates process improvements found through established methodologies and is supported by research that documents reduced lead time with the achievement of standard service time through Tailor-made Value Stream Mapping, Root Cause Analysis (RCA), and Time Study (Nurprihatin et al., 2024). The role of big data analytics in the facilitation of omnichannel retailing within the supply chain, particularly in logistics, is becoming increasingly important. This underlines the importance of data in contemporary supply chain management. Additionally, the proposed activity is expected to trigger a change of mindset in terms of decision-making practices to be proactive, thus fitting into the necessary competencies within the respective context of the supply chain to facilitate sustainable growth.

Methods

The community service activity utilized a participatory approach to learning, which focuses on engagement, relevance, and collaborative learning between the facilitators and the participants. The service activity was structured as a two-hour workshop. It included lectures and discussions as well as a feedback process.

Participant Application and Engagement Strategy

Participant recruitment involved an application and registration system aimed at enrolling undergraduate students pursuing logistics or industrial engineering degrees, early professionals working in supply chain-related fields, as well as student organizations associated with the International Supply Chain and Quality Academy (ISCQAcademy). The program required registration outreach via university networks, student organizations, and applicable professional networks. Out of the 40 registered, 35 participants attended.

Community service was performed on the Zoom platform. The ISCQAcademy and

Trent University Canada partnership served an objective of expanding audience reach. Community service was performed through the collaboration of all partners and focused faculty peers on the development of content, while ISCQAcademy managed the community engagement and Zoom platform. Online community service participants served the student and young professional demographic through active participation in online community service, pre-event and post-event surveys, engagement, and content responsiveness feedback sessions.

The event focused on three educational pillars:

1. Conceptual Enrichment. This entailed the exploration of new and emerging global and national innovations in supply chain sustainability.
2. Case-Based Learning - The use of practical examples to explain learning concepts.
3. Collaborative Reflection – Engaging in guided conversation to reflect on applications at personal/academic and organizational levels.

Workshop Design and Delivery

The planning for the activity was done using a participative or needs-driven approach that incorporated institutional, community, and scholarly know-how. This ensured that the needs of the community are well aligned with the learning outcomes and modes, as shown in Figure 2.

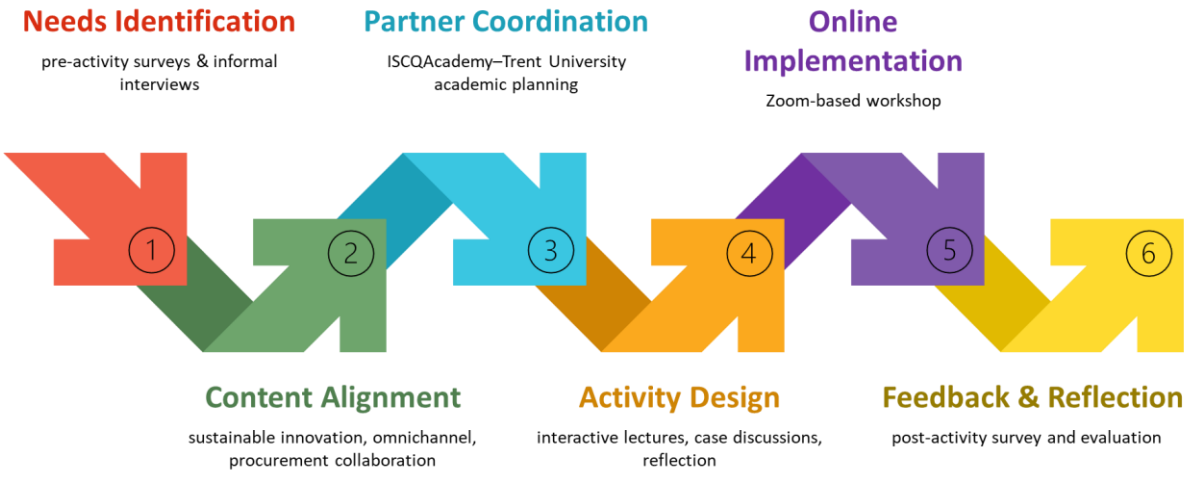

Figure 2. Planning Strategy

The topics were structured into seven modules, dealing with the basic themes of sustainable supply chains, as follows:

1. Part 1: The Role of Innovation in Modern Supply Chains
2. Part 2: Embedding Sustainability into Supply Chain Strategy
3. Part 3: Trends and Challenges in Omnichannel Logistics
4. Part 4: Enhancing Connectivity and Streamlining Operations
5. Part 5: Procurement Innovation and Strategic Partnerships
6. Part 6: Case Studies in Transformation and Resilience
7. Part 7: Challenges and the Future Outlook of Global Networks

The sessions were facilitated by Assistant Professor Filscha Nurprihatin and Assistant Professor Ali Vaezi, assisted by online facilitators. The facilitators ensured that the activities were conducted online and that the participants were well-supported by the online facilities and feedback forms.

Implementation

This community service activity was conducted on Monday, the 21st of October 2024, organized by the ISCQAcademy. Preparations began four weeks before the event, including coordination of materials and information technology assistance for presentations, as well as the distribution of pre-session readings to have a common level of understanding among the participants. Also shown are Figures 3 and 4, highlighting the opening and the outline of the presentation.

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Figure 3. Opening of the Presentation

Figure 4. The Outline of the Presentation

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Figure 5. Discussions During the Session

During the sessions, several online platforms were utilized. Some of the platforms include Zoom Meetings, Microsoft PowerPoint, and Google Forms for feedback. By employing online platforms, the facilitators were able to alter the course of events during the sessions based on the needs of the participants, as illustrated in Figure 5. Pre- and post-activity questionnaires were conducted to test changes in levels of knowledge, attitudes, and confidence regarding sustainable supply chain innovation. The post-activity questionnaires are illustrated in Table 1.

Table 1. Community Service Activity Survey

Activity Evaluation: Sustainable Innovation in Supply Chain **Instructions:** This questionnaire is to help determine the level of understanding the participants have obtained from the topics addressed throughout the activity. Your input is greatly appreciated to help improve next year's programs, and your confidentiality is guaranteed.

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Section 1: Participant Information
(This section helps us understand the demographic context for feedback.)

1. **Age Group:**
   - 18-25
   - 26-35
   - 36-45
   - 46+
2. **Level of Education:**
   - High School
   - Bachelor's Degree
   - Master's Degree
   - Other: _____
3. **Are you currently working in a supply chain-related role?**
   - Yes
   - No
4. Nationality (open-ended questions)

Section 2: Understanding of Topics Delivered

4. **How well do you understand the following topics covered during the activity?**

(Please rate your understanding on a scale of 1 to 5, where 1 = Not at all, and 5 = Very well)

Topics	**1**	**2**	**3**	**4**	**5**
The role of sustainability in supply chains	[ ]	[ ]	[ ]	[ ]	[ ]
Omnichannel challenges and opportunities	[ ]	[ ]	[ ]	[ ]	[ ]
Procurement innovation and partnerships	[ ]	[ ]	[ ]	[ ]	[ ]
Enhancing connectivity and streamlining operations	[ ]	[ ]	[ ]	[ ]	[ ]

5. **Which topic did you find most challenging to understand?**

(Open-ended question)

6. **Do you feel the examples provided during the activity (e.g., case studies, real-world examples) helped clarify the concepts?**
   - Yes, very much
   - Yes, somewhat
   - No

Section 3: Practical Application

7. **How confident are you in applying the following strategies in a real-world supply chain scenario?**

(Please rate your confidence on a scale of 1 to 5, where 1 = Not confident, and 5 = Very confident)

Strategy	**1**	**2**	**3**	**4**	**5**
Implementing sustainable practices in supply chains	[ ]	[ ]	[ ]	[ ]	[ ]
Managing omnichannel supply chain challenges	[ ]	[ ]	[ ]	[ ]	[ ]

Collaborating with partners for procurement innovation	[ ]	[ ]	[ ]	[ ]	[ ]
Streamlining operations through technology and automation	[ ]	[ ]	[ ]	[ ]	[ ]

8. **Please describe how you might apply one of the strategies discussed during the activity to your work or future projects.**
(Open-ended question)

Section 4: Engagement and Delivery

9. **How would you rate the delivery of the following aspects of the activity?**
(Please rate on a scale of 1 to 5, where 1 = Poor, and 5 = Excellent)

Aspect	**1**	**2**	**3**	**4**	**5**
Clarity of presentation	[ ]	[ ]	[ ]	[ ]	[ ]
Engagement with participants	[ ]	[ ]	[ ]	[ ]	[ ]
Use of real-world examples	[ ]	[ ]	[ ]	[ ]	[ ]
Relevance of the content to current supply chain challenges	[ ]	[ ]	[ ]	[ ]	[ ]

10. **What aspect of the presentation helped you understand the material best?**
- Presentations/Slides
- Group Discussions
- Case Studies
- Hands-on Activities
- Other: _____

Section 5: Suggestions and Feedback

11. **What suggestions do you have for improving the community service activity in the future?**
(Open-ended question)

12. **Any additional comments or insights?**
(Open-ended question)

Thank you for your participation and feedback!

Results and Discussions

The program has produced various quantitative results that meet the initial aims of the project:

1. Knowledge Enhancement

   Results from the pretest and posttest analyses show significant improvements in conceptual knowledge. To illustrate, only 30% of participants correctly defined “omnichannel logistics” before the session, whereas 82% did so after the session. This enhancement in knowledge

also extended to the area of concepts of sustainability, mainly with respect to carbon footprint measures and circular purchasing.

2. Engagement and Participation

   The level of participation remained high, with over 90% of the participants contributing to the discussions. The presentations demonstrated good application of the concepts, including cost-benefit analyses of green supply chains.

3. Feedback Summary

   Feedback received from the participants included:

   a. 93% of these participants thought that "the workshop was highly relevant to my career/study path."
   b. 89% considered that case studies were 'effective' or 'very effective' at explaining real-life application.
   c. There was a need for more follow-up sessions and more guest speakers from the industry.

4. Capacity Building

   A few participants noted that within a month of the community service event, they had already started working on the proposals for their final projects, internships, or student organization activities.

Impact and Reflection

The community service initiative was catalytic in that, so the program had a positive community impact. The initiative had divergent positive impacts on individuals in educational contexts, and more broadly in discussions around sustainability.

1. Individual Impact

   On a personal level, there was a greater conviction of the value of integrating sustainability into supply chain management. Also, they became acquainted with professional language and contemporary terms within the field of logistics and operations.

2. Institutional and Educational Impact

For ISCQAcademy, the project served to re-emphasize the importance of the applications and certifications training and the reality of the curriculum. Moreover, the project demonstrated the potential of community service to construct professional capacity in a way that is usable and functional.

3. Reflection and Lessons Learned

   From the perspective of the facilitator, three major reflections are outlined:

   a. Content Personalization: Presenting global trends with local examples is a great help.
   b. Collaborative Delivery: The co-facilitators' collaboration is a motivating factor for the sessions.
   c. Scalability Potential: The module can be scaled to vocational school students, small and medium-sized enterprises (SMEs), and regional logistics organizations with a few adjustments.

The outcome of the community service activity aligns with the existing theories on learning and supply chain management. As the participants' understanding and confidence improved, it is safe to presume that the improvement is correlated to the Experiential Learning Theory (ELT), which is defined to be an experience-based learning process through reflection and interaction (Ansari, 2025). ELT is experiential learning that combines knowledge and skills through active and authentic learning (Ryan, 2025). ELT has been and is in active use in various disciplines such as engineering (Baahmad, 2025), healthcare (Ramos et al., 2025), and language education (Gusma et al., 2025). The implementation of case studies, discussion, and feedback facilitates learning through the ELT approach and is demonstrated through numerous professional and academic studies, showing improvement in readiness and understanding of the concepts (Saikrishna, 2025).

Participants’ engagement and the relevance of what they bring to the table can be explained as knowledge and understanding are built through social interaction and reflection (Rai, 2025; Yakubu et al., 2025). Participants taking lead roles in the activity enabled them to collaboratively address complex challenges such as omnichannel logistics and sustainable procurement practices.

In the field of supply chain management, the results could be viewed through the lens of Supply Chain Integration Theory, which focuses on the organizational, supplier-customer, and vertical/horizontal integration for operational performance (Jama et al., 2024). This increased awareness among the participants about the importance of procurement collaboration and technological connectivity is an indicator that the concept of integration is no longer restricted to the operational practices but is recognized at the strategic level. This conclusion is supported by the finding that the flexibility of the supply chain is a combination of technological development and the integration of managerial practices and teamwork (Tannady et al., 2025).

Additionally, the emphasis on digital readiness and sustainability closely aligns with Human Capital Theory, as education and training are viewed as means to improve an individual's productivity and, in turn, the societal value (Akyıldız, 2025; Gapurzhanovna, 2025). This project shows that specialized community service projects can achieve an improvement in human capital significant to the industry, and the significance of the role played by the higher education institutions in connecting the knowledge and the reality of the supply chain.

Conclusion

The program "Global Networking: Sustainable Innovation in Supply Chain" exemplifies both a model of community outreach and a strategy for meeting an obvious educational/professional gap. Through the combination of theoretical knowledge and direct involvement, the program provided the necessary skills for the audience to deal with modern-day supply chains. Its great success in increasing knowledge and high levels of satisfaction, as well as the following participation, shows that the method works.

Looking ahead, it is expected that partnerships with logistics companies as well as professional organizations can help increase the realism of future versions. In addition, incorporating sustainability modules into academic as well as community service curricula can help speed up the transition to a more innovative supply chain-ready human resource pool for

Indonesia.

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